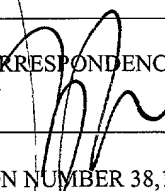
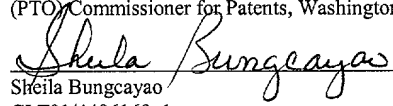


FORM PTO-1390 (REV 10-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 31749/238689
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) 09/936144
INTERNATIONAL APPLICATION NO. PCT/GB00/00816	INTERNATIONAL FILING DATE March 7, 2000	PRIORITY DATE CLAIMED March 10, 1999	
TITLE OF INVENTION MOBILE COMMUNICATIONS NETWORK			
APPLICANT(S) FOR DO/EO/US John Dunlop, James Menzies Irvine, Demessie Girma, Gwenaél Le Bodic			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
1.	<input checked="" type="checkbox"/>	This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.	
2.	<input type="checkbox"/>	This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.	
3.	<input checked="" type="checkbox"/>	This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).	
4.	<input checked="" type="checkbox"/>	The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).	
5.	<input checked="" type="checkbox"/>	A copy of the International Application as filed (35 U.S.C. 371(c)(2))	
	a.	<input checked="" type="checkbox"/>	is attached hereto (required only if not communicated by the International Bureau).
	b.	<input type="checkbox"/>	has been communicated by the International Bureau.
	c.	<input type="checkbox"/>	is not required, as the application was filed in the United States Receiving Office (RO/US).
6.	<input type="checkbox"/>	A English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).	
7.	<input checked="" type="checkbox"/>	Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))	
	a.	<input type="checkbox"/>	are attached hereto (required only if not communicated by the International Bureau).
	b.	<input type="checkbox"/>	have been communicated by the International Bureau.
	c.	<input type="checkbox"/>	have not been made; however, the time limit for making such amendments has NOT expired.
	d.	<input checked="" type="checkbox"/>	have not been made and will not be made.
8.	<input type="checkbox"/>	An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).	
9.	<input type="checkbox"/>	An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).	
10.	<input type="checkbox"/>	An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).	
Items 11. To 16. Below concern other document(s) or information included:			
11.	<input type="checkbox"/>	An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98.	
12.	<input type="checkbox"/>	An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.	
13.	<input checked="" type="checkbox"/>	A FIRST preliminary amendment.	
	<input type="checkbox"/>	A SECOND or SUBSEQUENT preliminary amendment.	
14.	<input type="checkbox"/>	A substitute specification.	
15.	<input type="checkbox"/>	A change of power of attorney and/or address letter.	
16.	<input checked="" type="checkbox"/>	Other items or information: International Preliminary Examination Report (PCT/IPEA/409) 2 Sheets of Formal Drawings	

533 Rec'd PCT/PTO 07 SEP 2001

U.S. APPLICATION NO. (If known, see 37 CFR 1.51) 09/936144		INTERNATIONAL APPLICATION NO PCT/GB00/00816		ATTORNEY'S DOCKET NUMBER 31749/238689	
17. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Neither international preliminary examination fee (37 CFR 1.482) nor International search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1,000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO But all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$ 100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$ 860.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	5 -20 =	0	X \$18.00	\$ 0.00	
Independent Claims	1 - 3 =	0	X \$80.00	\$ 0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$ 860.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by one-half.				\$	
SUBTOTAL =				\$ 860.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
TOTAL FEES ENCLOSED =				\$ 860.00	
				Amount to be	
				Refunded	\$
				Charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$ 860.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 16-0605 in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 16-0605.					
Note: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: Jason P. Cooper SIGNATURE  REGISTRATION NUMBER 38,114 ALSTON & BIRD LLP Bank of America Plaza 101 South Tryon Street, Suite 4000 Charlotte, NC 28280-4000 Tel Charlotte Office (704) 444-1000 Fax Charlotte Office (704) 444-1111 Customer Number 00826			"Express Mail" Mailing Label Number EL822756615US Date of Deposit: September 7, 2001 I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to BOX PCT, Attn: DO/US (PTO) Commissioner for Patents, Washington, DC 20231.  Sheila Bungcayao CLT01/4496169v1		

IN THE UNITED STATES DESIGNATED OFFICE (DO/US)

In re: Dunlop, et al. Attn: DO/US
International Appl. No.: PCT/GB00/00816
International Filing Date: March 7, 2000
For: MOBILE COMMUNICATIONS NETWORK

September 7, 2001

Box PCT
Commissioner for Patents
Washington, DC 20231

PRELIMINARY AMENDMENT

Sir:

Please amend the above-identified application as follows:

In The Specification:

On page 1, after the title and before the first paragraph, insert the following heading
--FIELD OF THE INVENTION--;

On page 1, between lines 3 and 4, insert the following heading --BACKGROUND OF
THE INVENTION--;

On page 2, between lines 22 and 23, insert the following heading --SUMMARY OF THE
INVENTION--;

On page 3, between lines 16 and 17, insert the following heading --BRIEF
DESCRIPTION OF THE DRAWINGS--;

On page 3, between lines 25 and 26, insert the following heading --DETAILED
DESCRIPTION OF THE PREFERRED EMBODIMENTS--.

In The Claims:

Delete Claims 1 – 6.

Add the following new Claims 7 – 11.

7. (New) A mobile radio communications network comprising:
a local exchange, or mobile switching centre, connected to a plurality of cell site
switches, each cell site switch being connected to a cluster of base station transceivers,
wherein one base station transceiver in each cluster acts as a macro cell and the
remaining base station transceivers in each cluster act as micro cells, characterized in that

- (a) each of the local exchange, or mobile switching centre, and the cell site switches incorporates a data base;
- (b) the connection between the local exchange, or mobile switching centre, and the plurality of cell site switches is in the form of a common bus to which each of the local exchange, or mobile switching centre, and the plurality of cell site switches is directly connected; and
- (c) the connection between each cell site switch and its cluster of base station transceivers is in the form of a common bus to which the pertaining cell site switch and base station transceivers are directly connected;
- whereby the network forms a hierarchial system in which the bus enables localisation of signalling to specific buses thereby reducing the signalling load in the local exchange, or mobile switching centre and, in each cluster the specific bus provides a fast signalling path which enables resources to be allocated between the base station transceivers as required to maintain a desired quality of service.

8. (New) A mobile communications network as claimed in Claim 7, wherein the common bus interconnecting each cell site switch and the respective cluster is a generic transmission medium.

9. (New) A mobile communications network as claimed in Claim 8, wherein the generic transmission medium is a local area network.

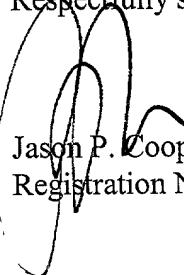
10. (New) A mobile communications network as claimed in Claim 7, wherein the common bus interconnecting the cell site switches and the local exchange, or mobile switching centre, is a generic transmission medium.

11. (New) A mobile communications network as claimed in Claim 10, wherein the common bus is a distributed queue dual bus network.

REMARKS

The above amendments are made to more clearly define the invention under United States practice. Please enter this amendment prior to calculation of the filing fee.

Respectfully submitted,

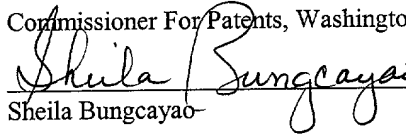

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Date of Deposit September 7, 2001

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Sheila Bungcayao

Version With Markings to Show Changes Made:

In The Claims:

Delete Claims 1 – 6.

Add the following new Claims 7 – 11.

7. (New) A mobile radio communications network comprising:
a local exchange, or mobile switching centre, connected to a plurality of cell site switches, each cell site switch being connected to a cluster of base station transceivers, wherein one base station transceiver in each cluster acts as a macro cell and the remaining base station transceivers in each cluster act as micro cells, characterized in that
(a) each of the local exchange, or mobile switching centre, and the cell site switches incorporates a data base;
(b) the connection between the local exchange, or mobile switching centre, and the plurality of cell site switches is in the form of a common bus to which each of the local exchange, or mobile switching centre, and the plurality of cell site switches is directly connected; and
(c) the connection between each cell site switch and its cluster of base station transceivers is in the form of a common bus to which the pertaining cell site switch and base station transceivers are directly connected;
whereby the network forms a hierarchial system in which the bus enables localisation of signalling to specific buses thereby reducing the signalling load in the local exchange, or mobile switching centre and, in each cluster the specific bus provides a fast signalling path which enables resources to be allocated between the base station transceivers as required to maintain a desired quality of service.
8. (New) A mobile communications network as claimed in Claim 7, wherein the common bus interconnecting each cell site switch and the respective cluster is a generic transmission medium.

9. (New) A mobile communications network as claimed in Claim 8, wherein the generic transmission medium is a local area network.
10. (New) A mobile communications network as claimed in Claim 7, wherein the common bus interconnecting the cell site switches and the local exchange, or mobile switching centre, is a generic transmission medium.
11. (New) A mobile communications network as claimed in Claim 10, wherein the common bus is a distributed queue dual bus network.

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MOBILE COMMUNICATIONS NETWORK

The present invention relates to mobile communications networks and in particular to network architectures.

A typical mobile communications network architecture comprises a mobile switching centre which is connected to the public switched telephone network (PSTN), the mobile switching centre being connected individually to several base station controllers each of which is connected individually to several base station transceivers. Each base station transceiver is capable of radio communication with mobile communications users within a specific area known as a cell. Cells are normally grouped in clusters and the radio resources allocated to each cell within a cluster are fixed, this is known as fixed channel allocation. In high user density areas cells have a geographically small radio footprint and may be overlaid by a larger umbrella cell which is appropriate for high mobility users. Resources allocated to the umbrella cell are unavailable to the smaller cells which it overlays. In this architecture resource allocation and all the signalling associated with allocating resources is handled centrally by the mobile switching centre.

As demand for mobile communications increases the trend in network architecture is towards employing increased numbers of smaller cells known as micro cells (or pico cells) together with a macro cell with a base station transceiver having a geographically large radio footprint

which overlaps the collective radio footprints of the micro cell base station transceivers. This allows low mobility users such as pedestrians to be allocated to micro (or pico) base station transceivers while high mobility vehicular users are allocated to the macrocell base station transceivers. In this case radio resources allocated to individual cells in a cluster are no longer fixed but may be allocated in a dynamic fashion based on allowable levels of interference to surrounding cells, this is known as

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dynamic channel allocation. This requires measurement of interference levels on the air interface by mobiles and base station transceivers and negotiation for available resources between individual base station transceivers within a cluster. However, this has a number of disadvantages namely:

Because mobile stations contend for resources over the air interfaces there is an increased load on the radio channels due to the dynamic nature of resource allocation and the need to update interference measurements frequently;

Because base station transceivers negotiate for resources in a dynamic fashion this adds significant signalling load to the traditional network architecture.

It is an object of the present invention to provide a mobile communications network which obviates or mitigates the forementioned disadvantages.

It is a further object of at least one embodiment of the present invention to provide a mobile communications network which produces a fast broadcast signalling path between base station transceivers and which does not require use of the air interface.

→ This is achieved by integrating each cluster of micro cell base station transceivers and the associated macro base station transceiver using a common bus structure.

According to the present invention there is provided a mobile communications network comprising a local exchange or mobile switching centre effectively connected to a plurality of cell site switches, each cell site switch being effectively connected to a cluster of base station transceivers wherein the connection between each cell site switch and the respective cluster is formed by a common bus to which each base station transceiver in the cluster and the pertaining cell site switch is directly connected.

By virtue of the present invention the network is layered and a fast signalling path is provided per cluster between the base station transceivers of that cluster

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thereby permitting improved allocation of the network resources by localising appropriate parts of the network signalling traffic. Furthermore, the base station transceivers negotiate for radio resources over the fixed network, rather than as a result of measurements over the air interface, by receiving or locking radio channels by transmitting a single signalling packet when all base stations are connected to the same common bus. This reduces the overall load on the radio channel and enables base station transceiver channel allocation on acknowledged reservations rather than on interference measurements.

Preferably the connection between the local exchange or mobile switching centre and the plurality of cell site switches is formed by a further common bus to which each cell site switch and the local exchange or mobile switching centre is directly connected.

An embodiment of the present invention will now be described by way of example with reference to accompanying drawings in which:

Figure 1 illustrates a known form of mobile communications network;

Figure 2 illustrates a mobile communications network in accordance with the present invention;

Figures 3 and 4 illustrates different performance characteristics for the Figure 1 and Figure 2 networks.

As is shown in Figure 1 a known form of mobile communications network 10 is connected to a public switched telephone network (PSTN). The network 10 includes a mobile switching centre 11 directly connected to the PSTN and directly connected individually to several base station controllers 12. Each controller 12 is directly connected to the individual base station transceivers 13 which form the cluster 14 for that controller 12. In each cluster 14 there is one macro base station transceiver 13A and several micro base station transceivers 13B. It will of course be understood that the network 10 in reality will be much larger than is illustrated but only three controllers 12

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and associated clusters 14 are shown in the interests of clarity. Similarly only a small number of base stations 13 per cluster are shown in the interests of clarity. The micro base stations 13B have geographically small radio footprints denoted 15B whilst the macro base station 13A has a geographically large radio footprint denoted 15A. Each Mobile Switching Centre 11 incorporates a data base which stores information used, as will be explained, in the allocation of radio resources to mobile users.

Figure 2 illustrates an alternative form of mobile communications network 20 which is in accordance with the present invention. In the network 20 the base station transceivers 13 with their footprints 15 are as previously described. However, in each cluster 14 each base station transceiver 13 is connected to a common bus 21 and the bus 21 in turn is connected to a cell site switch 22 which incorporates a database and which performs functions previously performed by the controller 12 and the switching centre 11. In the illustrated arrangement because there are three clusters 14, there are three buses 21 and three cell site switches 22. The cell site switches 22 are each connected to a further common bus 23 to which is also connected a local exchange 24 which performs certain functions previously performed by the mobile switching centre 11. The local exchange 24 is directly connected to the PSTN to which other local exchanges will also be connected in a large scale system.

The terms Mobile Switching Centre (MSC), Local Exchange (LE) and Cell Site Switch (CSS) are generic terms in a mobile radio network and functionality will vary very significantly between one manufacturer and another. However, the terms are well understood in the mobile radio environment and it is not thought necessary to reference specific examples.

Each common bus 21 is referred to as a virtual bus being a generic transmission medium which conveniently is implemented as a local area network, for example, based on

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but not restricted to the IEEE standard 802.3 bus specifications. Because all of the base station transceivers 13 within a cluster 14 are interconnected by the virtual bus 21 a fast signalling path is provided between these base station transceivers irrespective of their size, and resources can be allocated dynamically between them according to demand and for a mixture of services with reduced need for radio channel measurements in comparison to those required in network 10 of Figure 1. Accordingly the network 20 is particularly well suited to packet based communications.

The bus 23 is referred to a virtual backbone, also being a generic transmission medium but which is conveniently implemented as, but not restricted to, a distributed queue dual bus (DQDB) network based on the IEEE 802.6 specifications. Use of the virtual backbone 23 allows the localisation of signalling to specific virtual buses 21 and reduces the signalling load from the local exchange 24 in comparison to that required for the mobile switching centre 11 in the network 10 of Figure 1.

Generally, in mobile communications networks encompassing dynamic channel allocation it is known that the traffic for resource management signalling is very much greater (orders of magnitude greater) than that for mobility management. Resource management is the dynamic assignment of communication channels whilst mobility management involves the repeated registrations and de-registrations of a mobile user sequentially over a series of base station transceivers. Both resource management and mobility management utilise information held in databases maintained in the network.

Figure 3 illustrates database accesses for mobility management and comparing the network 10 of Figure 1 with the network 20 of Figure 2. Firstly for the network 10, because it is a centralised network, all accesses (i.e. 100%) go through the mobile switching centre 11 as shown at column A. Network 20, however, is not centralised and as

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shown at column B only about 85% of the accesses require to go through the local exchange 24 with the remainder as shown at columns C to H being confined to the cell site switches 22 (in this example there are six such switches).

5 In the architecture of Figure 2 the data bases are distributed between each CSS (22) and the LE (24). Hence if a handover occurs between cells of the same grouping, signalling traffic is handled exclusively by the appropriate CSS (22). However, if handover is between
10 cells of different groupings then two CSSs (22) and one LE (24) will be involved. Thus an overhead occurs in terms of the need to replicate signalling in two CSSs (22). Thus the total signalling appears to be more than 100%, however the LE (24) still has less signalling than the
15 centralised equivalent MSC (11) of Figure 1.

Figure 4 illustrates the data base accesses for resource allocation in a dynamic channel allocation environment and compares the network 10 of Figure 1 with
20 the network 20 of Figure 2. Again column A shows that in the centralised network 10 all accesses (i.e. 100%) go through the mobile switching centre 11 but at column B only about 24% go through the local exchange 24 of network 20 with the remainder distributed as shown at columns C to H over the six cell site switches 22 of network 20. The
25 fact that about 76% of resource allocation signalling traffic is confined to the local buses 21 is a major advantage of the network 20.

In Figure 4 the total signalling again appears to be more than 100% and the explanation is similar to that for
30 Figure 3 except that in this case a very much higher percentage of the resource allocation traffic will be localised. Only resources allocated to cells near the periphery of a grouping of cells will affect the interference levels in cells near the periphery of other
35 groupings. Only under these circumstances will resource allocation traffic be carried by two CSSs (22) and one LE (24). The overhead is thus much less, although the total

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traffic can still appear to be more than 100%. In this case the traffic carried by the LE (24) is about 25% of the traffic carried by the equivalent MSC (11).

5 The principal advantage of the present invention is that by interconnecting the system components via a bus structure efficient network control can be implemented. In particular, the present invention:

10 provides a broadcast mechanism for channel allocation and adaptive control of the radio interface which does not rely on channel measurements;

enables efficient algorithm implementation for localised channel allocation in cell clusters with umbrella cell overlays;

15 enables the partitioning of traffic based on speed of movement of mobiles to micro cells and macro cells, thereby increasing spectral efficiency;

provides a platform for incorporation of distributed intelligence and knowledge base; and

20 reduces the global signalling load on the network.

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CLAIMS

4. A mobile communications network as claimed in any preceding claim, wherein the connection between the local exchange (24) or mobile switching centre and the plurality of cell site switches (22) is formed by a further common bus (23) to which each cell site switch (22) and the local exchange (24) or mobile switching centre is directly connected.

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5 6. A mobile communications network as claimed in claim 5,
wherein the further common bus (23) is a distributed queue
dual bus network.

[illegible]

22 MARCH 2000

ART 34 AMUT

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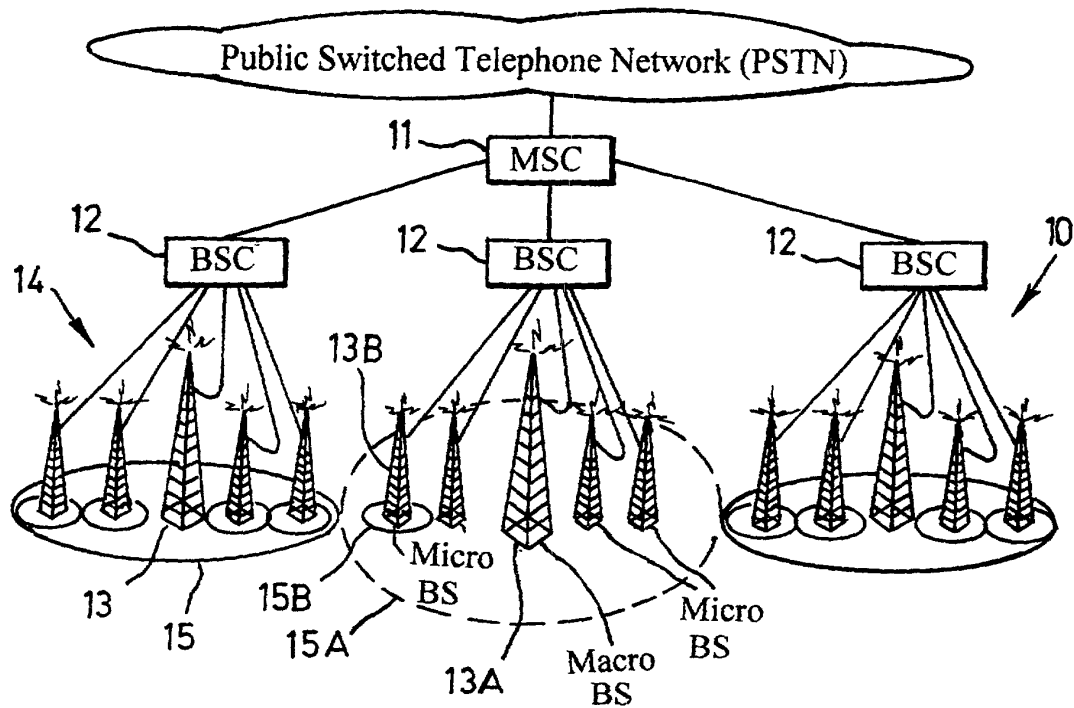


Fig. 1

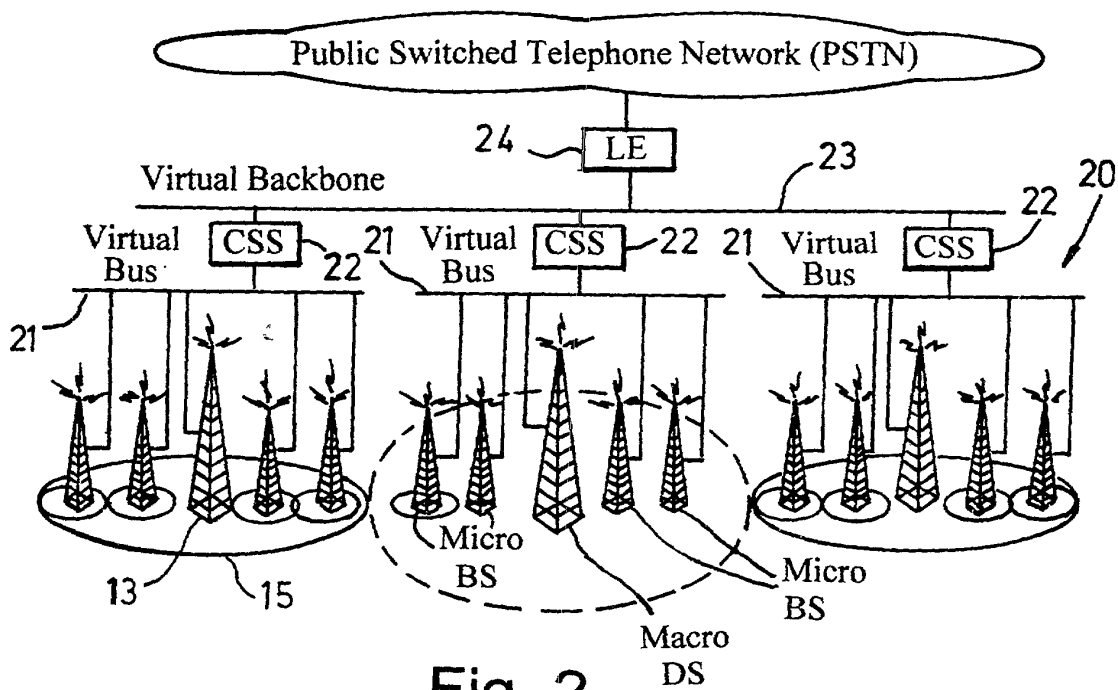


Fig. 2

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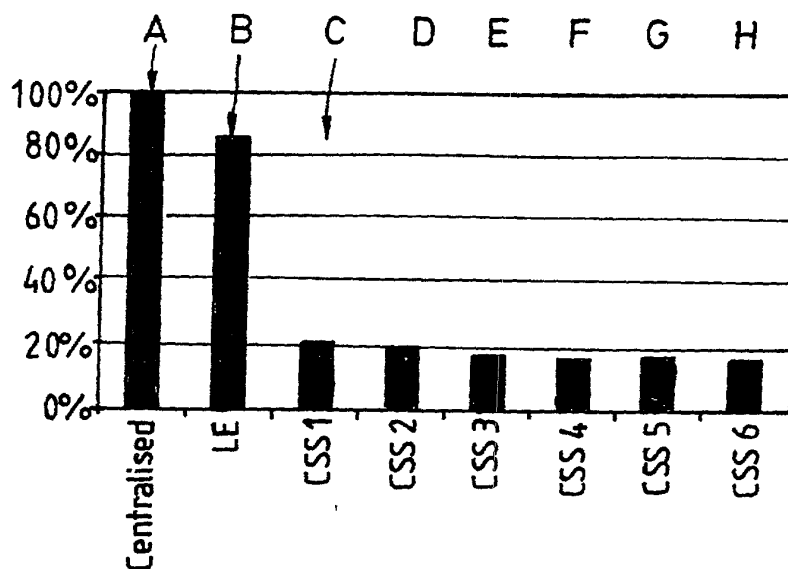


Fig. 3

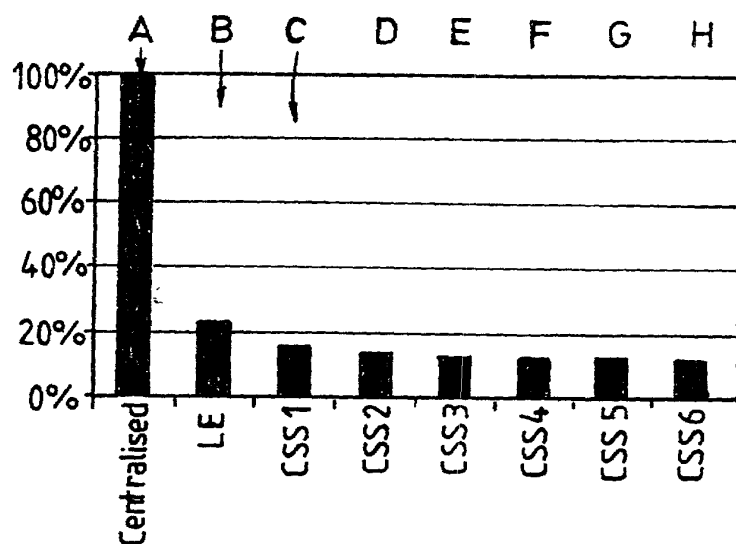


Fig. 4

Attorney Docket No. _____

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

(Foreign Agent Involved)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

MOBILE COMMUNICATIONS NETWORK _____

the specification of which is attached hereto unless the following box is checked:

☒ was filed on 7 March 2000 ✓ as United States Application Number or PCT International
Application Number PCT/GB00/00816 ✓ and was amended on 31 March 2000 and 2 March 2001 (if
applicable). and identified as USSN 09/936,144 ✓

I hereby state that I have reviewed and understand the contents of the above-identified specification,
including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR
§1.56

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign
application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which
designated at least one country other than the United States, listed below and have also identified below,
by checking the box, any foreign application for patent or inventor's certificate, or PCT international
application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Claimed

UK 9905372.0 ✓ United Kingdom 10 March 1999 ✓
(Number) (Country) (Day/Month/Year Filed)

☒ ☐
Yes No

(Number) (Country) (Day/Month/Year Filed)

☐ ☐
Yes No

I hereby claim the benefits under 35 U.S.C. § 119(e) of any United States provisional application(s)
listed below.

(Number)

(Filing Date)

(Number)

(Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C., § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Appln. Serial No.)

(Filing Date)

(Status --patented/pending/aban.)

(Appln. Serial No.)

(Filing Date)

(Status --patented/pending/aban.)

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from my European representatives, Cruikshank & Fairweather, as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

I hereby appoint the practitioners associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to that Customer Number:

Customer Number 000826

ADDRESS CORRESPONDENCE TO THE ATTENTION OF:

Samuel G. Layton, Jr.

Registration No. 22,807

DIRECT ALL TELEPHONE CALLS TO:

Samuel G. Layton, Jr.

Registration No. 22,807

Tel Charlotte Office (704) 331-6000

Fax Charlotte Office (704) 334-2014

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of first/sole inventor: John DUNLOP

Inventor's Signature: *[Signature]*

Date: 1/10/01

Residence: Glasgow United Kingdom GBX

Citizenship: United Kingdom ✓

Post Office Address: 28 Westermains Avenue Kirkintilloch
Glasgow G66 1EQ Scotland United Kingdom

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Inventor's Signature: *James Menzies* Date: 1st Oct 2001
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